CHURCHILL INFANTRY TANK

DAVID FLETCHER

ILLUSTRATED BY HENRY MORSHEAD

NEW VANGUARD 272

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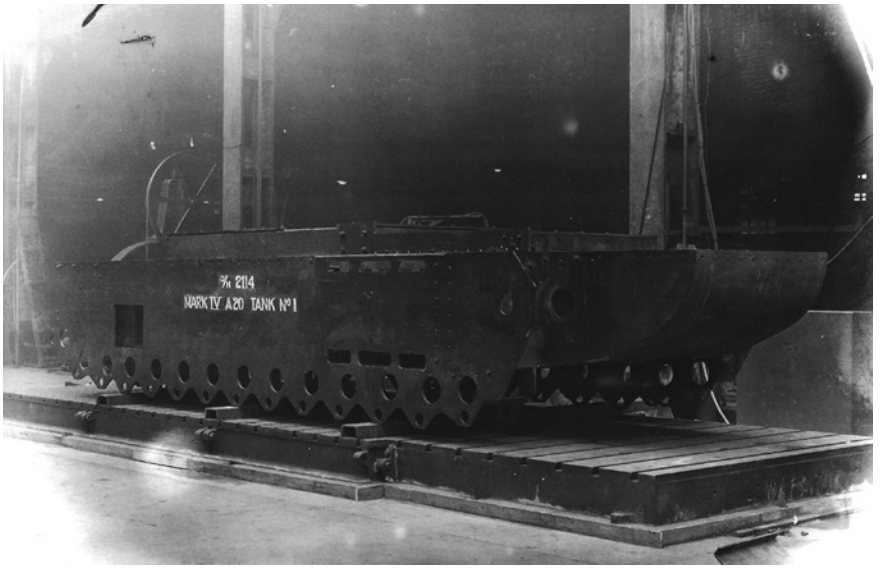
CHURCHILL INFANTRY TANK

A20 CHAR DE FORTRESSE HEAVY TANK

The A20 was first considered by the General Staff on 1 September 1939. While not wishing to interfere with the production of the Infantry Tank Mark II (A12 Matilda) or the Infantry Tank Mark III (Vickers Valentine), they foresaw an urgent need for a heavy tank, suitable for operating against a fixed German defensive line, crossing wide trenches, possibly over ground that had been pulverized by artillery – in other words to fight on a new World War I-style Western Front. The General Staff had in mind something like an updated version of the Anglo-American Mark VIII of 1918. They wanted it to be immune from the current German anti-tank gun firing solid shot, to carry and use an unditching beam – which immediately cancelled out the idea of a turret or indeed any kind of substantial superstructure – and ideally featuring a set of recessed tracks, inside the regular ones, to assist it over very soft ground. By the end of that month the Department of Tank Design supplied a drawing of a tank along these lines, but the Director of Mechanisation, General A. E. Davidson, didn't like it. He felt it was too restrictive.



The hull of an A20 under construction in Harland & Wolff's factory. Seen from the back, it is clear that the trench-crossing extension is part of the hull, not a subsequent addition as with the A12 Matilda.

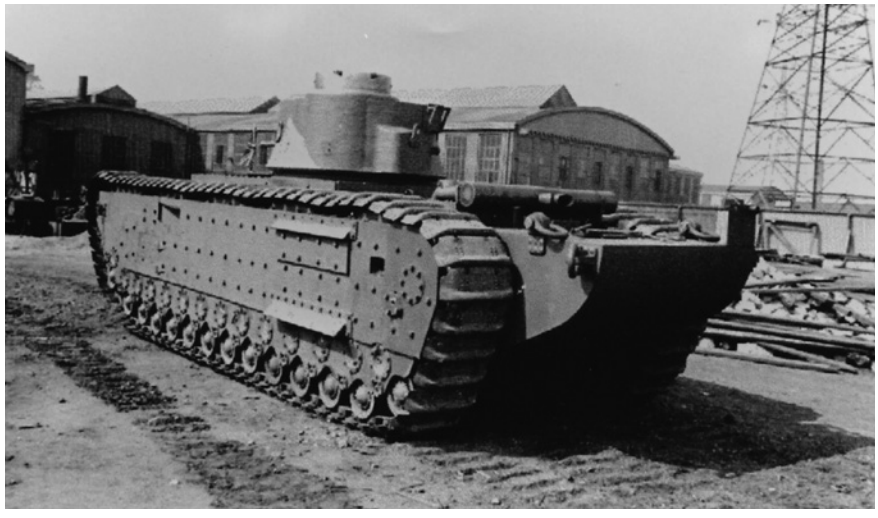
The completed tank, sporting a gunless Matilda turret. The front of the hull was stepped, to accommodate the driver and his mate, but the track frames extended forwards, beyond the front of the hull, and obscured the driver's view, except straight ahead. Another gun position was also located in the front of the hull, between the driver and his mate, and is said to have interfered with the actions of the driver; it certainly would have affected his concentration. The Union Flag in front of the turret was only fitted for the photograph.

The A20 tank was based on a general outline worked out at Woolwich Arsenal. Designers from Harland & Wolff were put to work, with expert advice from the Department of Tank Design. What they came up with was a large, slab-sided vehicle with armour covering the sides and suspension but with tracks totally exposed, running all the way around the hull. The suspension appears to have been derived from the prototype A7E3, but was designed with help from Vauxhall Motors. It ran on 14 pairs of flanged rollers each side, all-steel rollers running on the tracks and generating a considerable noise.

Davidson was imagining a tank with a turret, so the idea of an unditching beam was out. He was also against the idea of secondary tracks, and in order to keep the overall weight down recommended a maximum frontal armour thickness of 60mm (the A12 Matilda already had 78mm-thick frontal armour and was immune to the German 37mm firing armour-piercing shot). The new tank would only be able to keep out 37mm shells, not armour-piercing rounds. Davidson was also suggesting the new Meadows DAV flat-12 engine of 300hp and a new version of the Wilson epicyclic transmission that they planned to fit in the new A13 Mark III Covenanter (also known as the Cruiser Tank Mark V). But the Covenanter weighed 16 tons, while it was calculated that the A20 would weigh 32 tons. Davidson was also specifying the A12 Matilda turret which was designed to carry a 2-pdr (40mm) gun.

Indeed, the business of armament makes an interesting study in itself. In their original, turretless World War I design, the General Staff proposed side-mounted sponsons, each containing one 2-pdr and a co-axial Besa machine gun. When the matter of a hull gun was considered for a turreted A20, to be mounted at the front alongside the driver, the new 6-pdr (57mm) anti-tank gun was suggested, but it was pointed out that the barrel was too long and would stick out in front. This was anathema in those days, since they imagined the muzzle would dig into the ground. Brigadier Vyvyan Pope, who would later become Royal Armoured Corps (RAC) advisor to Lord Gort and the British Expeditionary Force in France, suggested shortening the gun but

The same tank seen from the rear, again to show the trench-crossing extension to the hull, but note the recessed machine-gun position along the side.

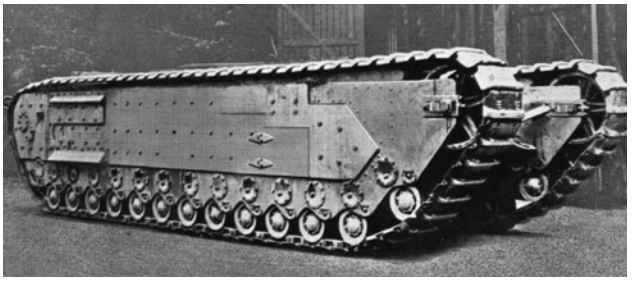


this was rejected on the grounds that it would ruin its ballistic capabilities. The same problem of a long barrel applied to the new 3in howitzer, although in any case only smoke rounds were available for it, no High Explosive (HE) round having then been produced. Even the old 3.7in close-support howitzer was deemed unsuitable because its muzzle velocity was too low for a concrete-busting round, while the stubby French 75mm howitzer, as fitted to their Char B tank, was rejected because it would be necessary to redesign the front end of the tank to take it.

The only other gun available that was suitable was the 2-pdr anti-tank gun, already mounted in the turret. This had a reasonable concrete-busting effect when firing solid shot, but its ability to fire a HE round was pathetic and, if mounted in the hull of the tank, it was limited to firing no more than 7.5 degrees either side of straight ahead due to the constraints of the front track horns; as far as we know it was never hull-mounted. In addition, in place of the original sponsons, two 7.92mm air-cooled machine guns were installed, one in each side of the tank, about on a level with the driving seats and each capable of a 90-degree arc of fire to the sides.

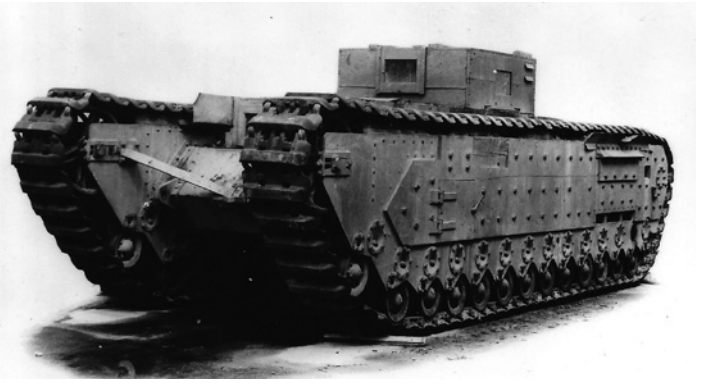
The matter of the engine was also reconsidered. Harland & Wolff hoped that their own new diesel engine would be considered. It was reckoned to be capable of delivering 300hp, but diesel engines still weren't popular for tanks among senior Army officers, and in any case it wasn't anywhere near ready. The Meadows DAV was felt to be underpowered for such a heavy tank, but it was ready, and so it was adopted until something better came along.

The running hull of an A20 as delivered to Vauxhall Motors. When the first tank was completed and dragged outside to be photographed it was running on riveted plate tracks with a prominent lip, not unlike World War I tracks. But before it was shipped to England these must have been changed for a new set, also with a lip but more open weave.



Vauxhall Motors of Luton in Bedfordshire had been asked to advise on the suspension for the A20. It's not clear why – up to that time the firm had no experience at all of making tracked vehicles of any kind, only private cars and commercial vehicles through their Bedford branch at Dunstable. However, they must have done this sufficiently well because they were next asked to produce an engine. It had to be a petrol engine of 350bhp, and they were given the dimensions of the space

it had to fit in. This proved to be the most difficult factor. The firm elected to build it as a horizontally opposed 12-cylinder created from a pair of six-cylinder Bedford lorry engines (hence it is sometimes referred to as the 'Bedford twin-six'). Although the firm was committed to overhead valves at the time, it was discovered that they would not fit the available space, so they reverted to side valves and claim to have completed the prototype in just 89 days. Naturally, having been created in such a rush, the new engine manifested a host of faults, but these were steadily overcome and in due course the engine, with a capacity of 21,300cc, with 12 cylinders of 5in bore by 5.5in stroke, proved to be completely effective, within its limited power output.



An A20 now in England, fitted with a wooden structure on top and running on its new tracks. It is also said that these tracks were reversed by Vauxhall Motors before the tank was sent on to the Mechanization Experimental Establishment at Farnborough.

When the first complete tank (albeit made of unarmoured steel as befitted a prototype) was rolled out of the Harland & Wolff plant in Northern Ireland, it was fitted with the turret of an A12 Matilda infantry tank (which Harland & Wolff were also building), and in this effectively finished condition was calculated to weigh around 40 tons. This immediately caused havoc within the ranks of the Royal Engineers, who announced that they had not got a bridge capable of taking such a heavy tank. The Matilda turret ring had a 54in diameter, and since this came close to filling the width of the upper hull it was probably the largest that could be fitted. A larger-diameter turret ring would have demanded a wider tank, and the stipulation that the tank must be transportable by rail ruled that out.

The Matilda turret, with its 2-pdr gun, looked quite small and puny on such a large tank. Even so, there was a drawback. In those days the turret cupola was still very much in fashion, and the cupola on this Matilda turret looked particularly large. Perched on top of the big A20 hull, it meant that the overall height went beyond the limit of the British railway loading gauge. So when the tank was shipped to Vauxhall Motors in Bedfordshire in the summer of 1940, it went without the turret, which in any case had to stay with Harland & Wolff to complete another Matilda. A lighter turret assembled from panels of rolled armour, but similar to the Matilda, was also being developed, possibly to take the new 6-pdr gun, but it was not yet ready.

The A20 was effectively another 'infantry tank' – a term that had not yet fallen into disrepute. However, to recognize the fact that it was designed explicitly to launch frontal attacks against enemy fortifications, the French term 'Char de Fortresse' was adopted instead, or the alternative term 'Shelled Area Tank'. Both terms were effectively meaningless, as the Germans proved in the summer of 1940, their Blitzkrieg invasion of France coming at roughly the same time that the first A20 was completed. At a stroke, the very nature of tank warfare had been altered. Positional warfare, which the A20 had been designed for, was a thing of the past. Faster tanks, such as the British cruiser, were the tanks of the future. But slower, more heavily armoured infantry tanks were still required, although they were invariably armed with anti-tank guns to defend attacking infantry from enemy tanks rather than concrete-busting weapons for use against field fortifications.

The birth of the Churchill

According to Lieutenant-General Sir Giffard le Q Martel, in his book *Our Armoured Forces*, Brigadier A.G. Kenchington, Royal Tank Regiment (RTR), prepared the requirements for the A20's replacement in conjunction with the Prime Minister and Vauxhall Motors. It had been decided to create a new tank and the project was to be awarded to Vauxhall. Quite why is uncertain, as they had no previous experience of building tanks. Although it is true that most tank-manufacturing engineering firms were already committed to making other designs, the urgency surrounding the new one, with a potential German invasion in the offing, would appear to militate against a totally inexperienced company. Why, for instance, the project wasn't given to Harland & Wolff is rather strange. After all, Harland & Wolff had built the abortive prototype and was also assembling A9 cruiser tanks and A12 Matilda infantry tanks so they had plenty of experience, as well as capacity to spare – they would later be added to the team of companies building the Churchill under Vauxhall Motors parentage.

Of course, on the upside Vauxhall Motors were conveniently based in England, they maintained a complete engineering department so they had the makings of a tank-builder, and the Ministry of Supply had promised to build them a new Shadow Factory (which would, however, take time). The fact that Vauxhall Motors had already produced the engine may have had some bearing on the decision. However, the engine is the subject of a historical inconsistency. Some sources claim that the two prototypes built by Harland & Wolff had different engines and transmissions. A20E2 is said to have had a Meadows flat-12 and Wilson epicyclic steering system, while A20E1 was fitted with a Bedford flat-12 prototype and a new transmission system developed by Dr Henry Merritt (Director of Tank Design) and known as the Merritt-Brown system. Yet Vauxhall Motors, in their book *An Account of Our Stewardship*, claim that they installed the first Bedford engine in A20E1 so that they could test it while the first Churchill was building. The question is impossible to solve.

Either way it means that the hull delivered to Luton was equipped with a Bedford engine. From another source we are told that test-running the tank amounted to 110 miles, including a comparative trial at Westbury in Wiltshire, and that in that time petrol consumption amounted to one gallon for every half-mile, the same as a World War I tank, while oil consumption was one gallon every 12 miles, which was excessive. Vauxhall noted that whereas

A

A20 AS A TEST LOAD

Four prototypes of the new A20 tank were ordered from Harland & Wolff of Belfast but only two were ever built, A20E1 and A20E2. Only one of the A20 prototypes came to England. A20E1 was shipped from Harland & Wolff in Belfast to Vauxhall Motors at Luton in August 1940. Then it went to the Mechanical Warfare Experimental Establishment at Farnborough (where it was number 1754) and from there, via an Experimental Bridging Establishment at Christchurch, to the Wheeled Vehicle Experimental Establishment, also at Farnborough, in July 1942. By this time it was no longer the prototype of a new kind of tank, but just a piece of ballast: a trial load for a huge prototype 70-ton-capacity tilt-bed tank transporter trailer built by Cranes of Dereham in Norfolk.

As such, it is shown here during trials on a hilly route. In fact it is not much of a makeweight since it weighs less than 40 tons, but it makes up for this in bulk. The 20-wheel transporter is in charge of three Diamond T 980 tractors, two pulling and one pushing from behind (for increasing braking power on a downward slope). For the moment the entire ensemble has stopped to rest on a wide bend, where there is room for other vehicles to pass.

WVEE
09
WVEE
HMX

A very early Churchill tank hull with a wooden box in place of a turret, climbing a bank on the test ground.

originally they were given the dimensions of the engine bay in the A20 and told to design the engine to fit, now, using the same engine, they had to design the tank around it.

The new tank was given the General Staff designation A22 and would be known as the infantry tank Mark IV. Later, when names for tanks became fashionable, it would be known as the Churchill, in honour of the man who instigated it. Dr Henry Merritt (originally of David Brown Tractors Ltd, but now Director of Tank Design) was drafted in to work alongside the Vauxhall engineers, since with a potential invasion looming, the project was most urgent. Apart from a few unarmoured pilot models, the tank was to be built straight from the drawing board, with no prototypes as such to reveal major faults ahead of production. It was decided to identify and correct faults during production, leading one commentator to remark that instead of building a few prototypes the firm was in fact building hundreds of them.

In anticipation of problems, Vauxhall Motors took the unprecedented step of inserting a short brochure into early tank handbooks entitled *POINTS TO WATCH* and addressed to Churchill tank crews, mechanics and workshop personnel. After first drawing attention to the urgency of the situation and pointing out that times were not normal, it went on to list those parts of a tank that were primarily mechanical, laying out the faults that might be expected in each one and how to remedy them. Indeed, the Prime Minister himself announced that such unreliability must be anticipated; the new tank was in many respects better than anything else available, and if it broke down, hopefully at some useful spot, it might still serve as a pillbox or strongpoint during the invasion. Martel himself had two criticisms of the tank which were never changed. One concerned the high nose of the vehicle, which Martel said was unnecessary, the other the steel rollers running on steel tracks. Martel would have preferred rubber tyres, saying that they were a lot less noisy than steel-on-steel, but supposedly steel was chosen because of the great weight of the tank.

While it featured a new engine and transmission, the A22 derived a lot of its features from the A20. The hull of the A22 was built in the pannier fashion: a central part which housed the crew, engine and gearbox was flanked by two slightly smaller but somewhat longer boxes, around which the tracks were fitted. As with the A20, the tracks were visible all the way round, at least on early production models. The hull sides, while not so high and slab-sided, were definitely similar, although fitted with a more prominent

door on each side, with equally prominent air intakes situated towards the rear which were detachable for rail travel.

The armoured covers were reduced at their lower level to reveal more of the suspension. Whether this was quite the same as on the A20 is uncertain. It now featured 11 pairs of twin bogie wheels on each side, each roller of steel being flanged to run along the tracks. These were suspended from independent bogies with short pivoting arms attached to a vertical bracket, held in place by a multiple spring unit bearing down upon it. The return run of track at the top passed over five raised bumps that eased its passage, later replaced by full-length skid rails. Between the front track horns the hull front was still stepped, with the driver located on the right and a hatch above his head, but with less room between them and the front of the turret. The 54in-diameter turret ring was retained.

Whether or not it was first fitted to A20E1, the Merritt-Brown transmission was designed by Dr Merritt and manufactured by David Brown Ltd, hence the name. It was a triple differential steering system, fully regenerative and designed to engage a different steering ratio depending on which gear the driver selected. Brown's had been making tank gearboxes since 1935, but Henry Merritt's triple differential design, known originally as the Type 301C, was first fitted to the Churchill and became the standard British tank transmission for the rest of the war and afterwards. Using this system it was also possible to perform a neutral turn. With the gearbox in neutral and the tank stationary with the engine ticking over, movement of a steering lever would cause both tracks to turn in opposite directions until the tank was facing the other way. The tank's regular gearbox was incorporated into the transmission unit; on some very early Churchills (about 100 of them) it was a unit with five forward speeds using double helical gears, but this was soon replaced by a four-speed unit using stronger, straight-toothed spur gears. As the H4 transmission (H for horizontal) this became the standard transmission unit for all subsequent marks of Churchill tank. Demand for Merritt-Brown transmission units ultimately became so great that versions

The Prime Minister is helped aboard a Churchill Mark I, without its hull armament, during a demonstration of the new tank.

were manufactured by other plants all over Britain under David Brown control, but the parent firm in Huddersfield retained manufacture of the H4 transmission for Churchill tanks and the Z5 (vertical) transmission for Cromwell cruisers. One enduring complaint about the A22 was the noise it made while going along: inside the tank it was likely to deafen the crew and made it virtually impossible to hear the wireless set. The immediate solution was to reduce the operating speed from a maximum of 17mph to between 10 and 12mph. This could be done by blanking off top gear.

In addition to designing and building the tanks, Vauxhall Motors also had to find and negotiate with various firms (eventually up to 600) who would supply ancillary items, to design the layout of the new Shadow Factory, while at the same time and over the next few years they had to recruit up to ten major engineering companies who could also manufacture Churchill tanks, or components for them, under the parentage of Vauxhall Motors. Ultimately these firms were: The Birmingham Railway Carriage & Wagon Co. Ltd; Beyer Peacock & Co. Ltd of Manchester; Broom & Wade Ltd of High Wycombe; Dennis Brothers Ltd of Guildford; The Gloucester Railway Carriage & Wagon Co. Ltd; Harland & Wolff Ltd of Belfast; Leyland Motors Ltd of Leyland; Metropolitan-Cammell Carriage & Wagon Co. Ltd of Wednesbury; Newton Chambers & Co. Ltd of Sheffield; and Charles Roberts & Co. Ltd of Wakefield.

Vauxhall Motors themselves later became responsible, along with Broom and Wade, for reconditioning and updating earlier tanks into later Marks, which often involved stripping and rebuilding vehicles.

THE CHURCHILL TANK MARK I (A22) AND MARK II (A22A)

The original idea was to build the new tank with a 6-pdr gun, but this wasn't ready and, with the fall of France, wouldn't be for a while yet. Britain had lost so many 2-pdrs, the current and just acceptable anti-tank gun, that it was decided to continue the manufacture of that weapon at the expense of anything new. The first batch of tanks, some 1,400, would thus be fitted with a more compact turret to house the 2-pdr gun and a three-man crew. No close-support weapon would be carried in the turret; instead a 3in howitzer Mark I or IA would be fitted into the front of the hull, to the left of the driver. A gunner was provided, sitting to the left of the driver, but no loader. The latter function could be performed by the driver, if the tank was halted.

Shearer, a Churchill Mark I of 43 RTR, standing guard in the New Forest.

At the front of the tank, just behind the driver's and hull gunner's seats and facing forwards, there were two ammunition racks for the howitzer, one on each side, and each of 29 rounds. Major-General Vyvyan Pope complained loudly about the danger of carrying two types of ammunition in one

A Churchill Mark I with the Canadian Army but now with new-style air intakes and covered tracks.

tank, but there was little risk; the two rounds were so different in terms of size and weight that nobody was likely to become confused, and neither round would fit comfortably into the wrong gun. Pope would have done far better to complain about the location of the gun in the first place. Low down in the front of the hull, it could not be fired at all if the tank took up a hull-down position. The gun was limited in traverse by the extended front horns, more to the left than to the right, but this wasn't serious and could be overcome in the last resort by swinging the tank. What was worse was that the mounting limited it to 9 degrees of elevation, which was not nearly enough for a howitzer. The 3in howitzer had a long, rifled barrel, over 6ft, but with a muzzle velocity of just 600ft/sec. It fired either a smoke or a HE round weighing nearly 13lb, but the latter was not carried in the tank, due to its low muzzle velocity and limited range, and the fact that smoke was seen as the definitive close-support round in British tanks. The problem, or perhaps a great mercy, was that the supply of these guns was running out. It was already fitted to a limited number of A12 Matilda tanks and had been earmarked for a limited number of A13 Mark III Covenanters and A15 Crusaders. Now it was supposed to be fitted to Churchills too. As it turned out there were only enough to equip 303 Churchills, after which a new model would have to be produced.

Churchill hulls in a factory with a nearly completed Churchill Mark II leading.

The hull was built on what is described as a triple box girder system, making it immensely strong. At first it was all of riveted construction, since welding, already a well-known practice, was considered

A Churchill Mark II climbs aboard a 40-ton trailer hauled by a Diamond T tractor.

too unreliable for larger structures and most British heavy industry was committed to riveting. The central box girder was the main hull of the tank, stepped at the front where the driver sat, and otherwise more or less rectangular. It was sandwiched between two 'panniers' – the other box girders – which carried the tracks and suspension and provided extra stowage space inside the tanks. Armour was to a maximum of 102mm at the front, making it one of the most heavily armoured tanks yet built. A 54in turret ring was the biggest possible, given the turret's location between the tracks, so it could not take advantage of the side panniers. Yet it proved capable, in time, of taking each British successive anti-tank gun – the 2-pdr, the 6-pdr and the 75mm – although the next and most successful weapon, the 17-pdr, was too big for it.

Why a larger turret was not designed, one adaptable to take the 6-pdr when it was ready, is never explained. The turret was a single-piece casting, 1,000 of which were manufactured in the United States. General Steel had a contract for 600, which they were able to complete themselves, ready to be shipped across to Britain. A further 400 came from American Steel Foundries, but they could only complete each one as a rough casting and then had to send it to Pressed Steel or Pullman, where it would be finished off, mainly by careful grinding, before it was ready for shipment. The casting had various openings in it. Two of the largest were at the top; the largest, a round one, was for the tank commander's hatch and rotating cupola, and to the right of that a somewhat smaller rectangular one for the loader's hatch. There were also a number of much smaller holes for periscopes, a ventilator and a turret-mounted bomb-thrower for smoke projectiles. At the back was a fairly large, square opening, normally covered by a bolt-on plate, through which the gun could be removed. On the rear quarters on each side were pistol ports, which would be covered by heavy cast flaps. There were three vertical slots in the front: the centre one for the 2-pdr main armament, to its right a smaller one for the co-axial 7.92mm Besa air-cooled machine gun and on the left the gunner's No. 30 (or No. 33) telescopic sight which was graduated for both weapons.

A Churchill Mark II, of 48 RTR, lands over a rocky beach on the Isle of Wight from an LCT(3).

Inside, the two weapons and the sight were arranged to move up and down together manually by means of a shoulder bracket controlled by the gunner. This was not necessary – geared elevation could have been provided, but the British had decided

that firing accurately on the move suited a mobile weapon system. So the gunner was trained to control the weapon and adjust it in accordance with the ground. The turret was traversed by electrical power, which could be switched to manual if required. The mechanism for this was also controlled by the gunner, who was located to the left of the gun. Behind him, on a raised seat, was the tank commander, with a double hatch above his head set in a rotating segment called a cupola, but of no height at all. There were two periscopes set into this rotating segment, one facing in each direction. Forward-looking periscopes were set in the turret roof, for the gunner and the loader. This individual occupied the right-hand side of the turret. The loader had 150 rounds of 2-pdr ammunition, not all of it within easy reach, but it could be brought into ready-use stowage in quieter moments as existing rounds were used up. The 2-pdr round was light and easily manageable. Only solid armour-piercing rounds were normally carried, since the 2-pdr high-explosive round was hardly worth bothering with, especially given that the tank also had a 3in howitzer. In addition to handling the ammunition, the loader was also responsible for loading and firing the co-axial machine gun, but only when the main gun was not in use. He had one more specific duty, that of tuning and operating the No. 19 wireless set located at the back of the turret.

A Churchill Mark II photographed from the tower at Lulworth Camp, giving an excellent view of the layout of this tank.

Also in the turret were stowed other auxiliary weapons, a .303in Bren light machine gun, often carried on top of the turret and used as an anti-aircraft weapon on a Lakeman sprung mounting, a .45in Thompson sub-machine gun used for close-in defence and some hand grenades normally used for the same purpose.

The 3in howitzer mounted in the front of the hull was provided with a pair of virtually square openings in the front hull plate. The smaller, lower one on the right, closest to the driver, held the gun itself on its cradle, while the other, slightly higher and to the left of the gun, held the No. 33 telescopic sight; the aperture was covered by an external shield. The hull gun had geared traverse and elevation, even though movement was limited, because it would normally be firing while stationary against a static target. There was, however, a lot of criticism of the mounting. It let in an inordinate amount of dust and when depressed – even slightly – it left the gunner terribly exposed to incoming fire. The run-out valve, located underneath the gun barrel, was virtually inaccessible, while it was found that the gunner could not operate the firing mechanism while leaning forward to look through the sighting telescope.

Most of the driver's controls, like the three pedals and the gear change mounting, were entirely conventional. For steering, however, instead of two levers attached to the floor, the driver had a handlebar suspended from a pivot, attached to the underside of the front plate; an extension from this ran across the front of the tank and ended in a lever, operated by the gunner's left hand, that enabled him to steer in the event of an emergency, or to swing the tank when aiming the hull-mounted howitzer.

The five men who made up a Churchill crew posing for the camera. Note that the tank did not carry machine guns during training.

In the early summer of 1940, the new Prime Minister, Winston Churchill, announced that he required 500 examples of a new, simplified heavy tank, to be ready by the end of March 1941. Vauxhall Motors in particular strove to meet this requirement with the A22 tank, but it was a forlorn hope, as Churchill probably knew it would be. What he wanted to do was concentrate people's minds. Some prototypes were ready even before that date, but 500 production tanks simply was not possible, and the unnecessary haste resulted in some faults that might otherwise have been remedied. One oft-repeated story concerns the transmission. A build-up of leaking oil and grease from the gearbox, combined with sludge and mud drawn in through the air intakes, formed a compound that continued the action of the steering brake on one side after the steering lever had been released. To correct this extra swing, a novice driver attempted to activate the opposite gears and in doing so caused the overloaded transmission to blow up. Crews were also finding that ill-fitting hatches were causing the tank to leak in the rain and numerous other faults were being reported, notably with the suspension and later with the new engine itself. All these faults would be cured in time and many would have already been corrected, if prototypes had been built and tested first.

There were those who had their reservations, and on more than one occasion it was announced that production of the tank would stop, but there was no alternative design in the offing. When the Prime Minister, whose continued faith in the tank was remarkable (especially when it carried his

B

1: CHURCHILL II OF 14th CANADIAN ARMY TANK BATTALION, DIEPPE, 19 AUGUST 1942

Although most of the Churchill tanks landed at Dieppe were of the Mark III variant, armed with a 6-pdr gun, a few were Mark IIs armed with a 2-pdr. This tank, *Backer*, landed successfully, but even while coming ashore it was hit in the turret ring by a German 50mm anti-tank gun, which effectively jammed the turret. The tank belonged to B Squadron, the 14th Canadian Army Tank Battalion, also known as the Calgary Regiment, the junior battalion in 1st Canadian Army Tank Brigade. A short while later, while moving along the beach, *Backer* broke its left side track, probably due to the chert boulders that made up the beach becoming jammed in the track. Even so, the crew managed to traverse the turret by attaching it to the other track and were able to shoot up enemy houses on the sea front. Soon, though, those who were not killed surrendered and were taken as prisoners of war.

2: CHURCHILL MARK III OF 145th REGIMENT ROYAL ARMOURED CORPS IN TUNISIA

The Churchill Mark III had an all-welded turret and was armed with a 6-pdr gun. This one served with 145th Regiment RAC, which at one time was 8th Battalion The Duke of Wellington's Regiment, the 3rd Regiment in 21st Armoured Brigade. The tanks arrived in Tunisia painted an overall green colour; however, this regiment camouflaged their tanks with a disruptive pattern of cream or sand-coloured paint. Indeed some sources say that they smeared local soil over the green, although the finish looks too orderly for that. Another feature peculiar to this battalion was that they bent their wireless aerials backwards in order to reduce the silhouette of their vehicles when adopting a hull-down position.

1

2

An overhead view of an early Churchill Mark III photographed from the tower at Lulworth, again providing a good general view of the tank.

name), said that production should be energetically pushed forward in view of the tank's 'superiority over all other models', its future was assured.

The balance of this order for 2-pdr tanks, probably amounting to 1,100 or 1,200 machines, were completed as the Churchill Mark II, or Infantry Tank Mark IVa as it was described at the time. This mounted another 7.92mm Besa machine gun in the hull in place of the 3in howitzer, which was no longer available. These guns, for which a telescopic sight was also provided within a gimbal mount, were fitted into an enlarged opening in the front plate, and the stowage racks for howitzer ammunition were deleted; otherwise they were identical to the Mark I. One feature common to both Marks were triangular pieces of mild steel that covered the corners on each side, where the vertical front plate met the inner track frames. These had been added to prevent mud carried by the tracks from dropping onto the driver's position or the front gun mounting.

Towards the end of 1941, Vauxhall Motors announced that that they were testing a Churchill tank with rubber-tyred road wheels and that the results were promising. They said that fitting rubber tyres improved the performance of the tank and extended its life. They also claimed that it would improve the tank's fighting efficiency, although how they would know that isn't clear. The idea had been considered before, but a shortage of rubber had put paid to it. Two members of the Tank Board, Oliver Lucas and Colonel Green, stated that the A22 would never really be a reliable tank until it was fitted with rubber tyres, but the subject appears to have then been dropped. But in September 1942, the Fighting Vehicle Proving Establishment issued a report under the codename *Pusseyfoot* (their spelling), complete with photographs that show a reworked Churchill II fitted with rubber tyres. Whether this was the same tank referred to by Vauxhall isn't clear. It is fitted with a new style of short pitch track with a new drive sprocket and other items to match. The tyres are described as 7in wide and some 2in thick, but tests revealed that at speeds above 10mph they started to get warm and that by 16mph they were so hot they started to break up; further tests with larger-diameter rollers, still with rubber tyres, performed better, although comparative noise tests revealed they weren't that much quieter than a conventional tank fitted with ordinary steel rollers, so the project was dropped.

A22B: THE CHURCHILL TANK MARK III

The intention to mount a 6-pdr gun in the Churchill was not considered until February 1941, and even then, the 6-pdr Mark II was considered unsuitable. With a barrel 50 calibres long, it was deemed to be too long for a tank with a 54in turret ring, so it was only being manufactured for mounting on a field

carriage. In any case, no suitable turret capable of taking the 6-pdr gun had yet been produced.

The matter of a turret was already causing considerable argument. The favoured cast version was said to be too heavy, but the alternative, a box-shaped turret of flat, rolled-steel armoured panels, was causing some disagreement. The traditionalists said that it must be of bolted construction, while the more progressive element, backed by Babcock & Wilcox of Renfrewshire (a branch of the American company), favoured welding. The traditionalists argued that such large-scale welds would break apart under anti-tank fire, but Babcock & Wilcox said that it wouldn't. Since every firm that manufactured bolted turrets was fully committed for some time ahead, welding it had to be.

A pristine image of a Churchill Mark III fully reworked with new-style air inlets and complete track guards.

Babcock & Wilcox produced a welded armoured box for firing-at trials, which seemed to prove that the structure was sound enough, while the Iron & Steel Control Board procured adequate quantities of the right sort of plate. A shorter (69in) version of the 6-pdr gun was produced, with a reduced muzzle velocity on account of the shorter barrel length, but it was still better than anything that had gone before. However, the available plate tended to flake under impact, and the Iron & Steel Control Board announced that they were unable to supply plate that wouldn't do so. Later, the Board pointed out that supplies of armour plate suitable for welding were coming to an end, so Mark III Churchill production never went beyond 692 tanks (or 675, depending on source). Even so, some Mark III tanks lasted until the end of the war, some mounting the 75mm gun in place of the 6-pdr and others being employed as AVREs (Armoured Vehicles Royal Engineers).

Another feature that first came in with the Mark III, but lasted until the very end of Churchill production, involved the location of the co-axial turret machine gun. This was now mounted to the left of the main gun, whereas on Marks I and II it was on the right. This of course meant that the auxiliary weapon now came under the supervision of the gunner, as it was in most British tanks, although the loader, on the opposite side, remained responsible for loading and firing the turret-mounted 2in smoke bomb launcher, as well as operating the wireless set and naturally loading the main armament when required.

The 3rd Battalion Scots Guards in 6th Tank Brigade named some of their tanks after locations in Scotland. *Esk* is thus named after a river. It is a reworked Churchill Mark III in very smart condition, as became a Guards tank.

Dieppe

The raid on Dieppe, Operation *Jubilee* – the revised Operation *Rutter* – was scheduled for 19 August 1942. It would see Churchill tanks used aggressively for the first time. For diplomatic reasons, the new operation would be largely a Canadian affair,

A view along the beach at Dieppe showing wrecked and abandoned Churchill tanks, with a Mark III prominent in the foreground.

and the tanks would be those of the Calgary Regiment, now known as the 14th Canadian Army Tank Regiment instead of the British 48th Royal Tank Regiment. Dieppe was a small French town on the Channel coast with its own harbour and, according to British Military Intelligence, was lightly held by a small garrison who were not expected to be very alert, with the nearest German tanks more than 30 miles away.

The plan was to have the tanks land on the beach right in front of the town and then to advance off the beach, into the town, and continue on to an airfield a short way inland, then retire back to the beach and their landing craft – all within one tide before the Germans could stage any major reaction. It was what Winston Churchill once referred to as his 'Butcher and Bolt' scheme.

Thirty tanks were scheduled to land – all of B Squadron and most of C Squadron, with a selection of lighter vehicles: Daimler Scout Cars, Carriers and Jeeps. The tanks of A Squadron and a few others of C Squadron would remain offshore in landing craft as a floating reserve, coming ashore in two final waves if the operation was successful. The scheme was ambitious, and reliant on the force meeting hardly any opposition at all. The gun tanks would be supported by a few tanks mounting short-range flamethrowers, while others were fitted with a 'carpet' device intended to help them off the beach and up onto the sea wall and promenade. The beach wasn't seen as any problem at all; although it was believed to be shingle, and tanks don't like shingle, it was only a short distance before the tanks were on hardstanding. With engineers destroying road blocks, they would move through the town and up the road, knocking out a few gun batteries on the way, before reaching the airfield, which they would destroy, and then return to the beach, board the waiting landing craft and get away.

Only a few tanks captured at Dieppe were immediately in working order, but *Blondie* has been got running. However, following evaluation the Germans weren't terribly impressed.

Six Churchill Mark IIIs made up 'Kingforce' and they had their baptism of fire in the desert at El Alamein in October 1942.

It didn't work out like that. The German garrison were very much awake and standing to their guns on an anti-invasion exercise. The beach wasn't shingle, it was chert, which normally contains bigger stones than shingle and if anything is even worse for tanks. If they don't become bogged down, the chert can get in amongst the suspension and break the tanks' tracks. Of the 30 tanks earmarked to form the first two waves, one was disabled before the landing started, so 29 were taken ashore; of these, 15 or 16 made it across the beach and climbed onto the promenade, and the remainder either drowned at the water's edge, broke their tracks on the chert or had a track shot away by an enemy gun. The plan was for the tanks to cover and support the infantry, but they never had a chance. Enemy machine-gun fire cut the infantry to ribbons, some even before they got ashore, while the engineers charged with destroying the roadblocks were mostly shot down before they ever got there. Those tanks that got as far as the promenade could thus go no further and the drive to the airfield never happened.

Three types of Churchill tank took part: the Mark I with a 3in howitzer in the hull; the Mark II, three of which were equipped with Oke flamethrowers; and the Mark III with the short 6-pdr gun in a larger, welded turret. It was the Mark III type, some of which were fitted with the Bobbin carpet-laying device, that mostly managed to climb the sea wall onto the promenade. Finding they could go no further, some returned to the beach but by then it was virtually all over. Some landing craft were abandoned and burning on the water's edge, while those still afloat took off the surviving troops. All the tanks, some still in working order, were left behind. Thus examples of the newest British tank fell into German hands. Not that the Germans were terribly impressed – in terms of firepower, protection (although only two are said to have been penetrated) and mobility, not to mention general design, it was not a patch on some of the designs they were building, or on some of the Soviet designs they were meeting on the Eastern Front, notably the T-34 and KV-1.

Kingforce and Tunisia

Less than two months after the Dieppe disaster, six Churchills arrived in Egypt and were formed into the Special Tank Squadron under Major Norris King MC of the Royal Gloucestershire Hussars. These were not the first Churchills sent to the Western Desert, however. Two Mark II tanks had

Photographed from low down at the front, this Churchill gun carrier looks menacing, armed with a 3in AA gun which was quite formidable for its day.

been out there for six months or more for evaluation and had performed better than anyone expected, despite being rather ravaged by the sea air on the way out, having been shipped as deck cargo.

The six tanks, all of the Mark III version, had been subject to the Rework Programme (see page 22). Upon arrival in Egypt they were each fitted out for operation in desert conditions, which included suspending a canvas screen, or 'dodger', low down at the front to prevent sand from blowing up into the driver's face.

All eight were loaded onto a train and taken west. It was the first stage in their advance to El Alamein, where they were destined to take part in the great battle against Rommel's Afrika Korps. Now known as Kingforce after their commander, the Special Tank Squadron was directed towards Kidney Ridge, where some dug-in Axis tanks covered by 88mm guns were causing a problem. Three Churchills went into action: one, commanded by Corporal Kelly, withdrew with a jammed gun, while Second Lieutenant Appleby went too far in his tank, was hammered by the enemy, and upon reversing out of action in a cloud of smoke was hit repeatedly by a British anti-tank gun, at which point the tank was stopped and caught fire. Only Major

C

1: CHURCHILL ICS: 'BUSHMILLS IV'

This Churchill tank is most unusual. Not only has it been fitted with a second 3in howitzer in the turret, it also mounts a cupola from a German Panzer III. This was fitted in order to improve the commander's view when the tank was closed down. The 3in howitzer was not an ideal close-support weapon since it only fired smoke shells, regarded as the essence of close-support before the war. The tank, although well past its prime, served with the North Irish Horse in Italy, the senior regiment in 21st Army Tank Brigade. However, later, when serving with 25th Army Tank Brigade, the North Irish Horse took part in the attack upon the Gothic Line, and the Bushmills IV, for the one and only time, was called upon to fire smoke shells in support of a river crossing. Immediately afterwards, in September 1944, the tank was retired from active service.

2: CHURCHILL MARK IV MODEL NA75, NORTH IRISH HORSE, ITALY 1944

This illustration shows a tank that was in Montefiore, Italy, on 11 September 1944. It is a type NA75, converted in Tunisia by removing the 6-pdr gun and mounting and replacing it, having modified the turret, with a 75mm gun and mounting from a disabled Sherman. The American M34 mount seems to have been used exclusively, and 210 Mark IVs are said to have been converted. Some Churchills in Italy were therefore issued with a 75mm dual-purpose gun while their contemporaries in Britain were having their 6-pdrs upgraded to 75mm and chambered to fire American ammunition. Since the American mounting featured a .30-calibre Browning machine gun, this remained in place, and to avoid confusion with different types of ammunition the hull Besa machine gun was also exchanged for a Browning. Internally, ammunition stowage for the main gun had to be changed, from the original 57mm rounds to the American 75mm, but it was found that it was still possible to stow the same number of rounds (81) despite the bigger calibre.

Although the North Irish Horse was a militia regiment, indeed the only one remaining, it apparently took precedence over 51 RTR, since it started as a Territorial Army Infantry Battalion, and 142 RAC, which had once been 7th Battalion The Suffolk Regiment. So as the senior regiment in 25th Armoured Brigade, its symbol a black diablo with a white maple leaf near the top, it wore 161 in white on a black square. Notice also that this tank belongs to A Squadron, indicated by the red open triangle above the gun.

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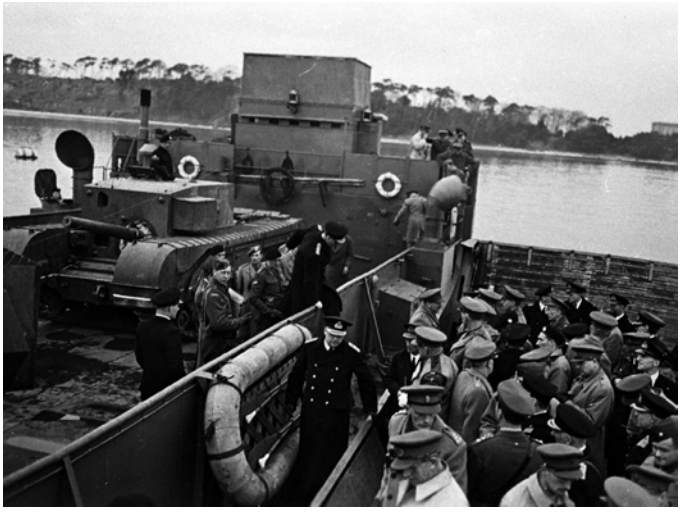


Shown aboard an LCT off Brownsea Island in Poole Harbour, this Gun Carrier is giving fire support ashore. The Naval officer climbing over the side is Lord Louis Mountbatten, Head of Combined Operations.

King survived the action in the third tank, which took a lot of punishment and did some effective damage. The five surviving tanks of Kingforce then took part in the action at Tell-el-Aqqaqir on 2 November 1942. They suffered from mixed fortunes but all survived, including one that broke a track. However, the westward chase was now on, in which the Churchills were considered too slow to keep up (although the Valentines were sent), so Kingforce was sent back to Alexandria and disbanded.

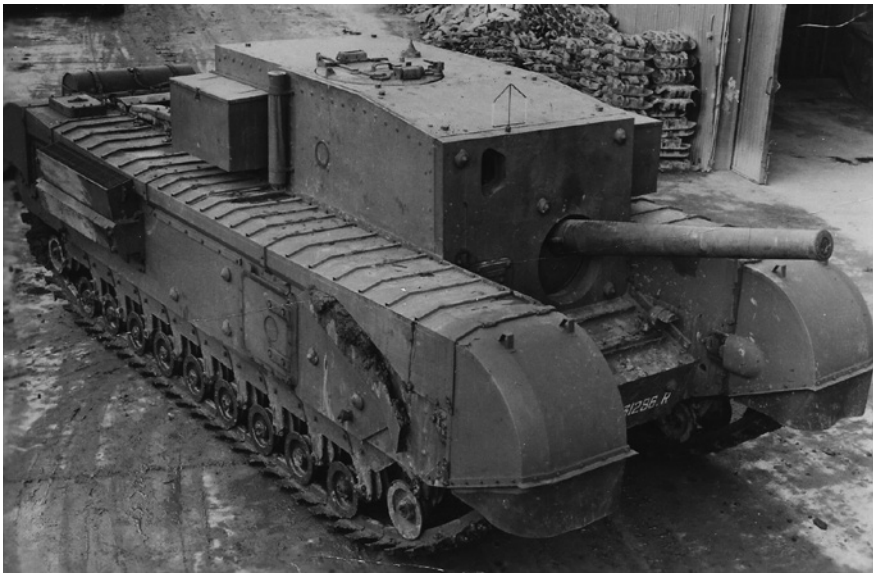
If one regards Dieppe and El Alamein as a mere toe in the water for the Churchill, the tank's first real test in action was in Tunisia in 1943. Both 25th and later 21st Army Tank Brigades were sent out there, and it was two Churchill tanks from A Squadron, 51st Royal Tank Regiment of the former brigade that fought an action that revealed the Churchill tank's hidden quality, its hill-climbing ability. Ordered to attack a hill behind a place known as Steamroller Farm on 28 February, the two tanks climbed a difficult slope, taking out an 88mm anti-aircraft gun on the way, and upon arriving at the top discovered a mixture of enemy tanks and transport stopped in the valley below them, which they proceeded to destroy before retiring down the hill again.

Commanding the leading Churchill was the squadron commander, Captain E. D. 'Gin' Hollands, and the action was described by the enemy commander as that of a mad British tank battalion that scaled impossible heights. This reputation was maintained, and in April another Churchill battalion, the North Irish Horse, did some similar and very effective work against German defences on Longstop Hill. It was a pattern that would be repeated in Italy.

This unusual angle of the Gun Carrier offers some idea of the size and shape of the superstructure.

The rework programme

Sometimes called 'The Great Rework Scheme', this was applied to 700 of the first 1,000 tanks (the first 300 were excluded, not being worth updating). Two firms, Vauxhall Motors themselves plus Broom & Wade of High Wycombe, were removed from the Churchill tank production programme in March and April 1942 and turned over their production lines to rebuilding existing tanks. The other firms continued to build new tanks to the latest specifications but were not required to incorporate any rework features as such. Reworked tanks were identified by the letter R added as a suffix to the W.D. number and are best identified externally by the two most



The same vehicle seen from ahead, the tube on the side holding signal flags within easy reach of the commander's cupola.

obvious features: full-length steel mudguards fitted in three sections on each side and new-pattern side air intakes which drew in air from above, instead of underneath. A booklet issued later listed 71 modifications. Improvements were made to the suspension, including continuous strips to support the top run of the tracks instead of the five raised bumps fitted originally; many engine accessories were modified or exchanged; and modifications were introduced to the transmission and to internal stowage. The hull was rebuilt to incorporate some waterproofing, which suggests that each tank was stripped back to basics on the production line, while patches of appliqué armour were added to the sides and a baffle plate located low down at the back to prevent dust being blown forwards when the tank was going along.

The rework programme culminated in a trial, codenamed *Trent*, involving 25 reworked tanks from 21st Army Tank Brigade in and around the town of Hawick on the Scottish border. A number of failures were identified, but the report on the trial never actually said whether the rework scheme had worked or not, although it was suggested that slower running and better preventive maintenance would have reduced a number of the problems.

Meanwhile, production of new tanks was continuing, although many of these would be eligible for the rework scheme in due course. However, a committee of the Tank Board announced that Churchill production would cease when 3,500 tanks had been completed, which they expected to be in March 1943. They anticipated that a suitable replacement tank would be ready by then, although the date slipped by a month almost immediately. They visualized a new tank based upon the A27 Cromwell – something heavily armoured, but faster and a lot more reliable than the Churchill. A number of experimental prototypes appeared, plus others that never got beyond the design stage. One of the most promising was the A33 *Excelsior* designed by English Electric of Stafford. Described as an Assault Tank, it had the same outline as the A27 Cromwell with 114mm of frontal armour and a new design of suspension hidden behind skirting plates. Two prototypes appeared, one intended as the British alternative to the American T14 Assault Tank, the other as a potential replacement for the Churchill.

A row of Churchill Mark IVs showing the cast turret. The tank on the end has an experimental finish, the British answer to Germany's Zimmeritt.

Both had a potential top speed of 24mph, but the prototypes weren't ready until the end of 1943 and trials soon revealed that neither was really suitable for its intended role. However, by that time the Churchill had overcome most of its problems.

A22C: THE CHURCHILL MARKS IV AND V WITH CAST TURRETS

The decision to replace the welded turret of the Mark III with a cast one is unusual on the face of it. The Bullet-Proof Plate Technical Committee announced that they would be unable to guarantee the supply of rolled armour plate that would not flake when hit. They suggested instead an inner turret of steel with armour panels bolted to the outside for protection; turrets of this sort were already being proposed for the Cromwell family of cruiser tanks. It was unclear if this was suitable for protecting an infantry tank, however, and the only alternative was to go for a cast one. This had been suggested earlier, but was apparently rejected on account of weight. Now, however, British casting techniques had caught up with American practice, so the new turret was calculated only to weigh half a ton more than the welded one and to be a good deal stronger. Weight would now be increased to 39 tons, but since much of this would be taken up by panels of appliqué armour attached to the sides of the hull it was not considered to be critical.

Initially it was decided to fit the shorter Mark III version of the 6-pdr gun since that was deemed more suitable for a tank with a 54in diameter turret ring, but later the longer Mark V version was fitted and no serious difference was noted. Following the innovation on the Mark III Churchill,

the co-axial Besa machine gun was now on the left of the main armament, where it remained on all subsequent versions. This change meant that firing the machine gun, as an alternative to the cannon, was also the province of the tank gunner, while the loader remained responsible for loading and firing the 2in smoke bomb launcher in the turret roof and operating the wireless set, as well as loading the main armament. In most other respects, including internal stowage, the Mark IV was more or less the same as the Mark III. Like most Churchills, the new turret featured electric traverse, although the main armament still operated by shoulder control, or free elevation as it was termed at the time. However, some of the new tanks had a form of geared elevation, as did some early examples of the Mark III.

A Churchill IV in a tank park in Italy with three men working on the turret.

A close-support version was also considered. The 3in howitzer was no longer thought to be suitable (although it was still used in Mark I Churchill tanks in Italy, where some were modified by installing a second 3in howitzer in the turret, making it a true close-support tank. A few of them were fitted with a cupola from a captured Panzer III which, by giving the Churchill a higher profile, provided a much better view for the tank commander). The new gun was going to be a 95mm howitzer with a typical short barrel, but like most 'new' weapons invented in Britain it was actually devised from two existing weapons and the ammunition from a third. It was made from a short section of barrel from the 3.7in anti-aircraft gun, mated with the breech assembly of the 25-pdr gun/howitzer, firing ammunition from the 3.7in mountain howitzer. For some reason not adequately explained, it was deemed unsuitable for mounting in the welded turret, so there never was a close-support version of the Churchill Mark III. However, a cast turret would be entirely suitable and when it was learned that such a turret was about to be introduced anyway, the problem was solved. The new close-support Churchill, with a 95mm howitzer instead of a 6-pdr, was the Mark V.

A reworked Mark IV fitted with a long experimental periscope in a British depot. The idea of the long periscope was to give the tank commander a view over a large fascine.

Design work on the new gun began in January 1942 and its development was a slow process. Two versions were considered: a towed gun on a two-wheel carriage with a 20-calibre barrel for use as an infantry howitzer and a close-support howitzer for tank use. Neither its manufacture nor the scheme to use ammunition from the 3.7in was straightforward; the ammunition for the new howitzer had to be modified from the original rounds, while those destined for tank use had to be altered into a single unit of case and projectile to make it easier to handle in the confines of a turret. Three types of ammunition were

A Churchill Mark V tank devoid of any markings, photographed in a field. Note the 95mm howitzer fitted into the turret, which identifies a Mark V.

carried: a blunt-headed smoke round, a substantial and pointed high-explosive round and a HEAT round (High Explosive Anti-Tank) which was not very effective. Since, under normal circumstances, it was fired from a stationary tank at a stationary target, geared elevation was provided, in addition to powered traverse for the entire turret. About 10 per cent of the Mark IV production run was completed as Mark Vs, which means that some 160 Mark V tanks were made. Although normally portrayed as simply a Mark IV with a 95mm howitzer, the Mark V did in fact require a slightly different turret, at least in respect of its upper layout, with the ventilating fan moved more towards the centre of the turret.

Mounted in the tank, the howitzer was limited to an elevation of 37 degrees, not very much by normal howitzer standards but quite suitable for firing from a tank, which would only be engaging targets it could see. Maximum range for the piece is given as 6,800 yards, again not a great deal but more than adequate for a tank. A Mark V Churchill took part in jungle and mud-crossing trials with the Australian Army at Madang in Papua New Guinea at the end of the war and seems to have acquitted itself favourably.

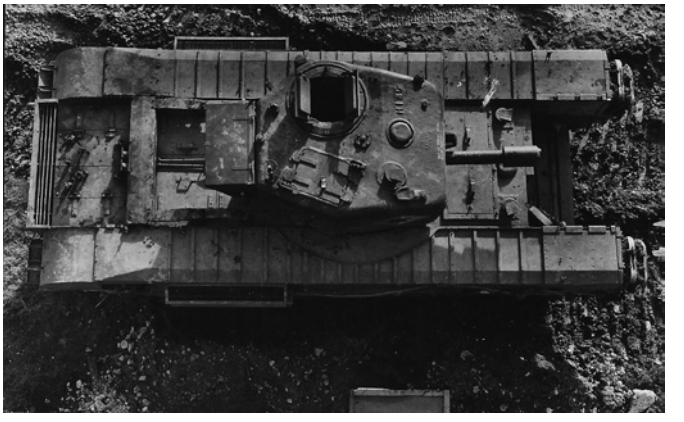
The 75mm gun in Churchill tanks

As early as December 1942 it was announced that Vickers-Armstrongs were investigating the possibility of adapting the British 6-pdr tank gun to fire American 75mm ammunition. Undoubtedly this was not as good as developing a suitable new weapon of 75mm calibre, but it was better than nothing. Vickers-Armstrongs had also been working on a new, high-velocity 75mm gun, although this proved to be too big to fit into the average British tank turret of the time.

A Churchill V with an odd fitting on top of the turret. It appears to belong to headquarters of C Squadron, 7th Royal Tank Regiment, at least if the number 991 is painted on a green square, while the diagonal white bar indicates garrison or area troops.

The idea of relining the barrel of a 57mm gun so that it could fire 75mm rounds seems highly dubious, but that's apparently what Vickers-Armstrongs did to create the British Ordnance 75mm gun. They noticed that the cartridge case of the American 75mm round was near enough the same size as the British 6-pdr round, and started from there. To create the gun they adapted the breech to take the American round and inserted a new liner into the barrel to fire 75mm ammunition. The great thing was that by retaining the outer shell of the 6-pdr barrel they could fit the gun in any existing 6-pdr mounting without any need for further modification. In theory any British vehicle designed to take the 6-pdr gun could now easily be adapted to take the 75mm, although to begin with the modification was only available on tanks. The new gun, although it had the same muzzle velocity as the American original, had a slightly inferior armour-

piercing capability and much shorter effective range. The Armoured Fighting Vehicle Liaison Committee announced in February 1943 that the new 75mm gun would initially only be available for tanks in the following order: first the A22 Churchill, then the A27M Cromwell, followed by the A27L Centaur and finally the Valentine. They said that the first Churchills would be ready by August 1943, but qualified it by saying that the number converted would depend on how many were required to retain 6-pdr guns.



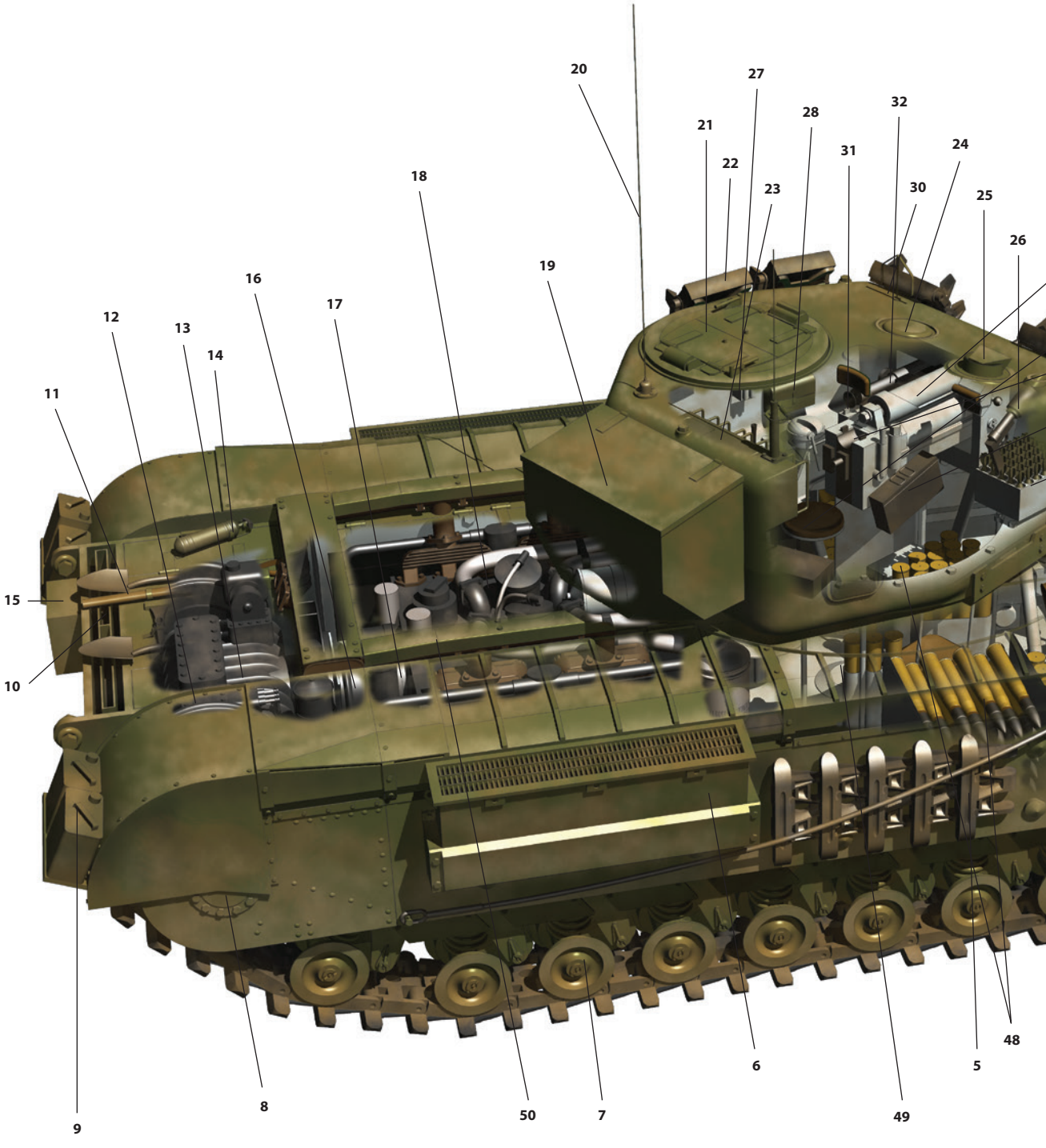
Taken from the tower at Lulworth, this gives a direct overhead view of a Mark V Churchill. No markings can be seen apart from the symbol of the Gunnery School painted on the side of the turret.

Meanwhile, the situation in Italy was giving rise to some concern. The British Army was operating with Sherman tanks in Italy, but no Churchills. There were six regiments of Churchills in Tunisia and their crews were showing increasing signs of boredom with the endless cycle of maintenance and training, but there appeared to be no sign of them seeing action again. Some sources suggest that this was due to General Montgomery and his preference for a Universal Tank instead of the British division of tanks into cruiser and infantry types. Since the Sherman came closest to his idea of a Universal Tank, the Churchill was banned from Italy. Churchill tank crews, however, believed that it was because none of their tanks mounted a dual-purpose 75mm gun, which was understood to be essential for the kind of combat that tanks were encountering in Italy. This view was shared by Captain Percy Morrell, an officer of the Royal Electrical and Mechanical Engineers (REME) who was second-in-command of 665 Tank Troop Workshops at Le Khroub in Tunisia. Morrell is credited with the idea of fitting the entire 75mm gun and mounting from a Sherman tank into the turret of a Churchill Mark IV and thus creating the Churchill NA75. There were numerous problems to solve in the process, but ultimately it worked and 210 NA75 tanks were built on a production line at Bone, Tunisia, and saw service in Italy, where they appear to have been very successful. Churchill tank regiments went across to Italy in April and May 1944, but it was nearer the end of the summer before the 75mm gun Churchills arrived. Subsequently they were joined by Churchills with the British 75mm gun, although it seems to be agreed that the locally converted tanks with the American gun were better than those with the modified British gun.

When the British 75mm gun was installed in the Churchill Mark III, it became the Mark III*. Yet the Churchill Mark IV was known officially as the Churchill IV conversion to 75mm, or simply sometimes as the Churchill IV (75mm). The Churchill Mark VI, which was also effectively a Churchill IV with a 75mm gun, was built as a new tank and will be treated as such later.

A22D: THE CHURCHILL 3IN GUN CARRIER

Unlike the Germans, the British had not at this time taken to the idea of self-propelled artillery in any form, and those types that they did make were boringly utilitarian and not even terribly functional. The Churchill 3in Gun Carrier was a case in point.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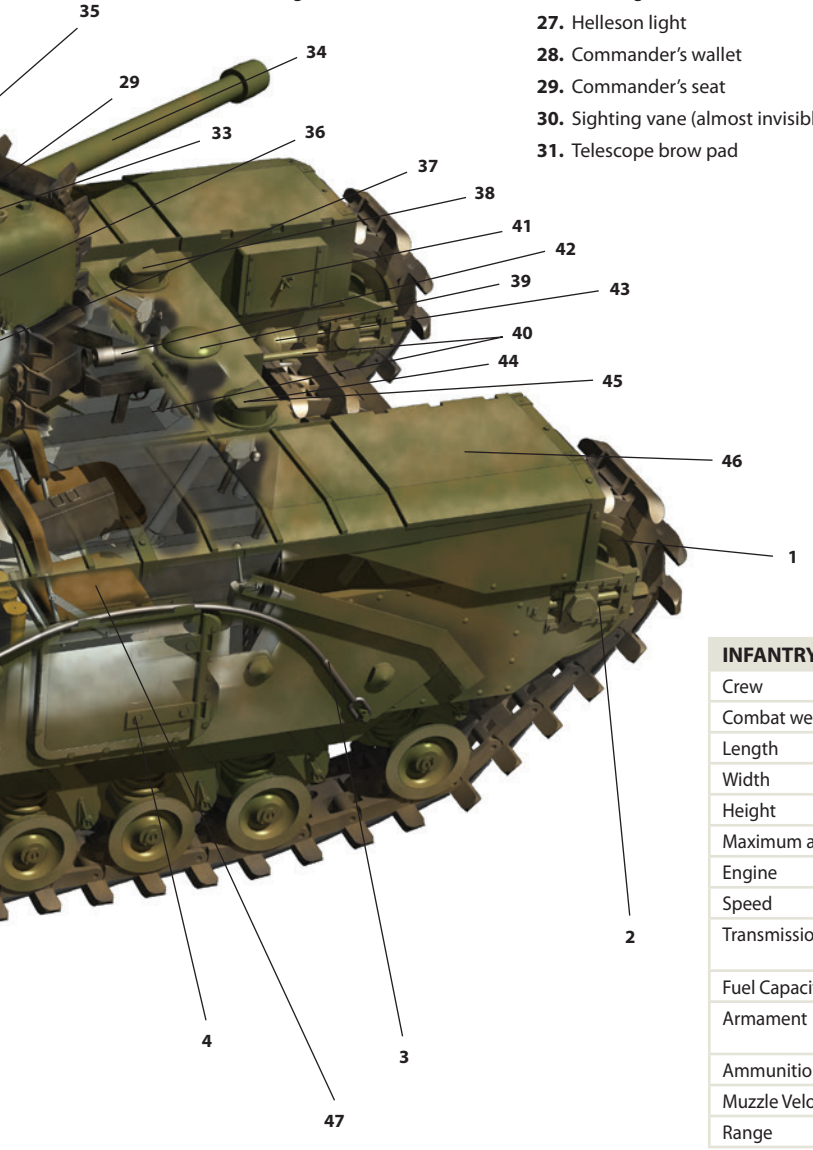
KEY

1. Idler wheel
2. Track adjuster
3. Tow rope
4. Side door
5. Spare track links
6. Air intake
7. Road roller and suspension unit
8. Drive sprocket bearing
9. Petrol/oil/water cans
10. Air outlet
11. Pioneer tools
12. Steering brake (starboard side)
13. Merritt-Brown gearbox & transmission
14. Fire extinguisher
15. Telephone box
16. Clutch
17. Flywheel
18. Bedford flat-12 engine
19. Turret stowage box
20. Main wireless aerial
21. Commander's cupola
22. Extra track link for protection
23. No.19 wireless set
24. Turret ventilator
25. Loader's periscope
26. Smoke grenade launcher
27. Helleson light
28. Commander's wallet
29. Commander's seat
30. Sighting vane (almost invisible)
31. Telescope brow pad
32. Sighting telescope
33. Breech block
34. 6-pdr Mark III gun
35. Recuperator
36. Box of machine-gun ammunition
37. Extra smoke grenades
38. Hull machine-gunner's periscope
39. Hull machine-gunner's sighting telescope
40. Besa machine-gun
41. Wooden jacking block
42. Hull ventilator
43. Headlamp
44. Driver's periscope
45. Spare track link covering driver's visor
46. Track guard
47. Driver's seat
48. 6-pdr ammunition
49. Rotary base junction
50. Exhaust system



INFANTRY TANK MARK IV, CHURCHILL MARK IV	
Crew	5
Combat weight	39 tons
Length	24ft 5in
Width	10ft 8in
Height	9ft
Maximum armour thickness	102mm
Engine	Bedford flat-12
Speed	15.5mph
Transmission	Merritt-Brown regenerative steering and four-speed gearbox
Fuel Capacity	150 gallons on internal tanks
Armament	57mm 6-pdr Mark III gun and two 7.92mm Besa air-cooled machine-guns
Ammunition Stowage	84 rounds
Muzzle Velocity	2,630 feet per second
Range	2,000 yards

The Churchill was well adapted to carry infantry. This tank belongs to 6th Guards Tank Brigade and is carrying Royal Scots Fusiliers in Normandy.

The original idea was to build 100 of them as powerful tank destroyers in the event of invasion. This quantity was reduced to 24 and then raised again to 50, but the vehicle had yet to be designed and built, and during this time the threat of invasion reached a peak and then steadily diminished until the reason for making them in the first place had all but vanished. Latterly it was planned to use them in Heavy Support Companies attached to tank brigades – ten in each company, three to each regiment and one left over – but this came to nothing and they were never used at all.

The Royal Artillery originally suggested creating a self-propelled mounting for a 6in howitzer. The Churchill chassis was selected as most likely although the A12 Matilda was considered as second choice, but this idea did not come to fruition either. The idea of using an anti-aircraft gun as an anti-tank weapon can be dated to March 1941 and is attributed to the Defence Committee, but the plan to mount it on the A22 chassis, as being the most suitable, was agreed sometime later. Building the thing was bound to interfere with regular Churchill production, but this was accepted in the interests of urgency. Vauxhall Motors were ordered to produce the prototype, which they did slowly, although they could not really see the point of it. The remaining 49 were contracted with Beyer Peacock, the Manchester locomotive builders.

The chosen gun was the 3in 20cwt anti-aircraft gun which was in the process of being replaced by the excellent 3.7in weapon in the anti-aircraft role, so plenty of them were available. However, the performance of the former weapon in the anti-tank role was not that impressive. Firing horizontally it had a maximum range of 12,000 yards, which was quite good, but firing an armour-piercing round of 12½lb (at 2,000ft/sec) it was said to be able to penetrate merely 84mm of armour at 1,000 yards – better than the new 6-pdr but only slightly so, and nowhere near the performance of the

17-pdr, which was already in the development stage and was effectively the same calibre. It was only seen as a temporary solution until the 6-pdr Churchill was ready and there were those who suggested that it might be better to await the arrival of that gun rather than embark upon a completely new vehicle. According to the stowage diagram, some 12 rounds of HE ammunition were also carried, so although it obviously was not regarded as important, this appears to be the first British tank to mount a dual-purpose weapon.

The superstructure of the self-propelled gun was nothing more than an uninteresting box. The vertical front plate was 89mm thick to match the thickness of the normal driver's visor plate that it replaced; it was 76mm thick at the sides and just 15mm thick on the roof. Total weight on the Churchill chassis, with gun, was 39 tons. The vehicle had a permanent crew of four. The commander could observe from a cupola about midway along on the right side; the loader was stationed to the left of the weapon and the gun layer seated directly behind and slightly above the driver. The driver was expected to remain in his seat during an engagement, in case the vehicle needed turning, which must have been awkward because the gunner had to reach over him to look through the sighting telescope and to work the gun controls. To say that it was cramped was an understatement. There was a rectangular door in the rear plate of the superstructure, and the crew were

The 75mm gun was also fitted to some Mark III tanks, which were duly designated Mark III*. This is one of them.

A Churchill of 4th Grenadier Guards, of 6th Guards Tank Brigade, driving down to the River Seine.

More 75mm gun Churchill tanks, covered in extra track plates, weaving their way through other traffic.

instructed to leave this door open if the vehicle was stationary and the engine idling in order to ventilate the compartment but to close it before the vehicle moved, since exhaust fumes could be swept inside.

The gun itself was situated low down at the front of the hull on the nearside, that is to the left of the driver. Elevation was limited to 15 degrees and depression to 10 degrees, but traverse was very restricted – just 5 degrees either side of the centre line, which is why the driver had to remain in place. No secondary armament was fitted, although a .303in Bren light machine gun was stowed inside and two Thompson sub-machine guns were also carried for crew use in an emergency.

As the threat of invasion receded, there seems to have been a long period of indecision over what to do with these vehicles. It doesn't even seem to have been clear how to classify them. The prototype, T31996, built by Vauxhall Motors, was classed as a tank, whereas the 49 built by Beyer Peacock were given numbers as self-propelled guns in the S series. In the end it was decided that one should retain its superstructure, but not its gun, and function as a carrier for lengths of Bangalore torpedo demolition tubing with the name 'Wurlitzer', while the remainder would be converted into armoured recovery vehicles, but even if this were done it did not include all of them since a few, which appear to have been used as hard targets, were found buried on a hillside near Folkestone in Kent and duly unearthed. The best of these, which is not saying much, was recovered to the Tank Museum at Bovington in Dorset and awaits its fate with other wrecks in the car park.

A22E: THE CHURCHILL MARK VI

With the return of British armour to mainland Europe, first in Sicily in 1943 and then in Normandy in 1944, it was noted that German snipers were

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A CHURCHILL MARK VI OF GUARDS ARMOURED BRIGADE IN NORTH-WEST EUROPE

The Churchill VI was not a well-known tank, being essentially a Mark IV fitted with the 75mm Mark V gun, but newly built, not a conversion. This is *Dundee* of No.1 Troop, Right Flank (A) Squadron, 3rd Battalion Scots Guards, the junior regiment in 6th Guards Tank Brigade. The tank's name and the WD number are painted on the air intake, the name in yellow and the number in white; an open triangle in blue is painted further forward on the side door, but other signs painted on the front of the tank are invisible. The tank is crossing a Churchill tank bridge (emplaced by a Churchill bridgelayer) with no room to spare at the side, probably being guided by a dismounted member of the crew and transporting infantrymen who are watching anxiously. Notice that a panel has been removed from the centre section of the track guard, exposing some of the top run of the track. This was probably done to prevent the metal from bending up when damaged and jamming the turret. The turret has also been camouflaged with strips of fabric. This was often done in hedgerow country, where the rest of the tank was hidden by the hedge so only the turret was visible. However, it is also being used as a location to hang other stores and crew helmets.

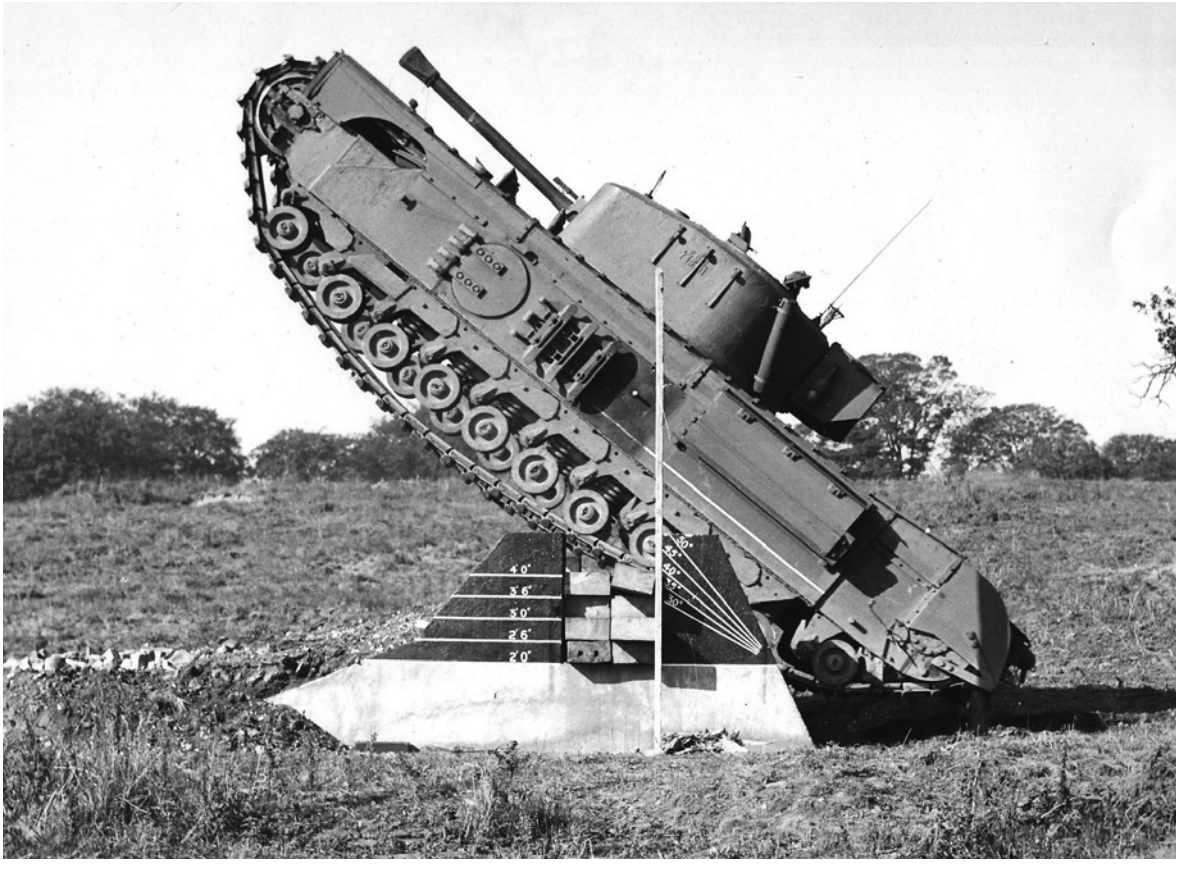
154
DUNDEE
T172855 B

Another 75mm gun Churchill covering other vehicles lined up at the roadside.

making a point of targeting tank commanders – even showing a few fingers over the lip of the open hatch was enough. As a result it was decided to design a new type of cupola, of lower profile than those that went out of fashion in about 1940 and with protected vision blocks all the way round. The result was a device known as the All-Round Vision (ARV) Cupola. It was designed to replace the ordinary round hatch in the top of the turret and to provide the tank commander with protected vision in all directions. However, as with most new things, production was slow so tanks were equipped with conventional hatches until the ARV Cupola was available.

The tendency for one of the significant features of a new tank often to be missing, making accurate identification difficult, applies in particular to the Churchill Mark VI. This is a type that many historians appear to have overlooked, and if they mention it at all they say that it is a modification of the Churchill Mark IV. In fact it appears to have been a new type of tank. What one assumes to be a prototype, T331700, is credited to Vauxhall Motors on contract 8/M12636, which sadly is undated. It mounts the 75mm Mark V or Mark Va gun but fires the same American ammunition and apparently had geared elevation. Its hull was the conventional Churchill type with square side doors, and it had the cast turret of the Churchill IV. The hull is fitted with appliqué armour. One source claims that the Churchill Mark VI ran on the 'heavy duty' suspension applied to the Churchill Mark VII, but an official booklet published in 1947 says that this applied only to Churchill Mark VII and VIII and that the Mark VI had the same suspension as the Churchill Mark IV.

Another photo of what could be a Mark VI, heavily protected, moving along a muddy track.



A new Mark VII Churchill shows off its climbing ability and the steep angle it can reach.

Indeed it is very difficult to identify a Churchill Mark VI from an upgunned Mark IV, which is also fitted with the 75mm gun. Both tanks appear to have similar appliqué armour. There were differences in the top of the turret, but these are difficult to identify, while the claim that only the Churchill VI had geared elevation for the 75mm gun (meaning that every Churchill Mark IV 75mm had free elevation) is very difficult to substantiate. In any case, it is impossible to tell from the outside. We are likewise rather restricted in trying to establish exactly how many Churchill Mark VI tanks were built. The type is only shown on two contract cards that we have seen: M5701 (undated) is for 500 Churchill tanks Marks IV, V, VI, VII and VIII but gives no indication of how many of each were made, and is therefore useless; M7454 (also undated) is for 1,000 Churchills Marks VI, VII and VIII, but clearly differentiates between the latter two (both A22F), of which it says 143 were built, so that in theory the remaining 857 were all Mark VIs. Since the Mark VI is seen as an interim model, pending delivery of the Mark VII, a fairly modest quantity may be about right.

A22F: THE CHURCHILL MARKS VII AND VIII

The future of the Churchill tank was in the balance while the authorities sought something to replace it with. In an effort to pacify the Americans, the term ‘infantry tank’ was dropped and replaced by Heavy Assault Tank,

With some of the crew, wearing tank helmets and provided with goggles, this Churchill VII of B Squadron, 107 RAC, leads the way towards Le Havre.

but the only one of these to show any promise was the English Electric 'Excelsior', or A33, and when that was rejected the Churchill was the only available such tank. The new Churchill was the A22F, which was ordered in substantial quantities. The feature that sets this tank apart from any previous Churchills was the adoption of circular orifices in the hull, notably for the side doors, the driver's lookout at the front and the hull machine-gun mounting for a 7.92mm Besa. The idea of adopting round, instead of square, openings had been suggested earlier by Babcock & Wilcox, on the grounds that square openings gave rise to weak corners while circular ones did not. But nothing was done while the future of the Churchill hung in the balance.

Although it looked like any other late production Churchill at first glance, the Churchill Mark VII was essentially a new tank, which is probably why it was redesignated A42 after the war. Often referred to as the 'Heavy Churchill' it weighed 40 tons as against 39 tons for the earlier model. It was of welded construction, which saved weight by not requiring an internal frame, but carried heavier armour, now 152mm at the front and 92.95mm at the sides. The concept of welding the hull wasn't new. It had already been tried on some Churchills quite successfully, notably by Babcock & Wilcox,

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A CHURCHILL MARK VII OF C SQUADRON, 7th ROYAL TANK REGIMENT, ARRIVING IN KOREA

This illustration is based on a photograph of a tank being unloaded from a ship onto the dockside at Pusan (now Busan) in South Korea. The tank carries the number 43, in white on an RAC flash divided diagonally red and yellow on the offside trackguard, and a curious flash on the nearside trackguard that cannot be identified (unless it signifies C Squadron) along with some equally mysterious numbers. The new (post-1948) registration number is painted on the front of the hull but is partly obscured. The tank features a flame projector in the hull machine-gun position. The Churchills of 7 RTR were sent out to Korea as Crocodile flamethrowers, complete with fuel trailers, but were only ever used as gun tanks, without the trailer. The Mark VII Churchill was armed with the 75mm Mark V gun and Besa 7.92mm machine guns, but under mass attack by Chinese Communist infantry the favoured reaction was for everyone to retreat inside the tank and secure all the hatches while a neighbouring tank sprayed it with machine-gun fire to drive off the attackers.

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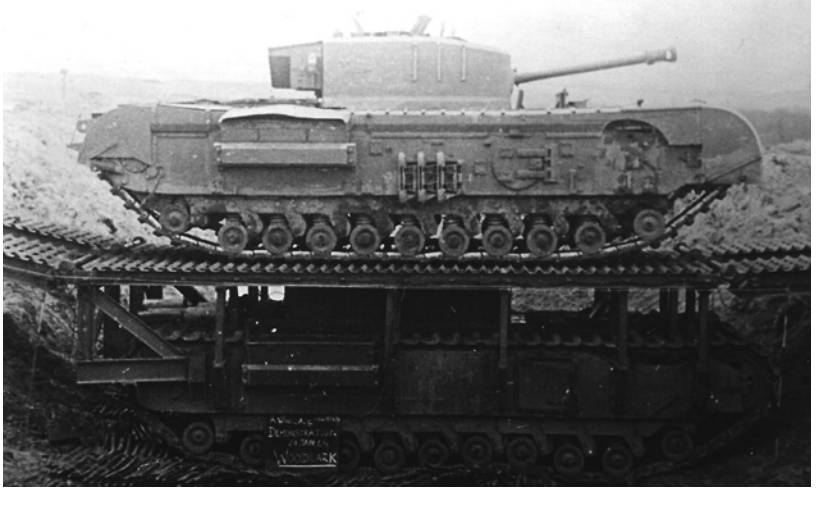
33 ZR

but British Army conservatism was still wary of it and preferred the tried-and-tested method of riveting.

The Heavy Churchill ran on new suspension units with stronger springs, which were not interchangeable with those fitted to earlier Churchills, although they looked similar. The tank was fitted with a modified gearbox, the Type H41, which had revised gear ratios, reducing the top speed on the Mark VII to 12.7mph, against 15.5mph on earlier Churchills. There were other differences too: for instance the air outlet louvres at the rear of the hull had been extended and the pistol ports around the turret and in the side doors had been eliminated. The turret likewise was a new structure, the four walls being formed from a single casting with a thick lip around the base to protect the turret ring. Turret armour was also now 152mm thick at the front and 92.95mm at the back and sides, with a roof of 20mm plate recessed in and welded at the top and a similar underside welded in place. Since the turret was also heavier, a stronger ball race was fitted in the top of the hull and another on the underside of the turret, which made it easier to traverse by electrical power when the tank's engine was running and by hand when it was not. The gunnery officer at Lulworth noted a tendency for the turret to jump when the direction of rotation was reversed – at least on the tank tested there – and it was also reported that the commander's cupola leaked when it was raining, something that had been complained about on Churchill tanks before.

The Mark VII Churchill mounted the not-very-inspiring 75mm Mark V gun with a co-axial 7.92mm Besa machine-gun on its left, but with a new Mark III pattern geared elevation system linked to a foot-operated firing pedal. There is a report of a Mark VII being fitted with a 6-pdr gun in the summer of 1944, which is not as crazy as one might think. In June 1944 a new Armour Piercing Discarding Sabot (APDS) round had been introduced for the 6-pdr which overmatched the frontal armour on a Tiger at ranges under 1,500 yards, so it was probably worth considering if the Churchill was to be seen as a tank-fighting tank, but since it was considered as a slow and heavily armoured infantry tank the experiment went no further. A lever, hanging down from the roof of the turret, could be used to hold the gun mounting steady when the tank was being driven, but when the gun was fired and needed to elevate or depress, this lever was folded up out of the way. A lock was also provided to hold the turret steady when the tank was moving but had to be disengaged before going into action.



A Churchill VII tests Woodlark, a new kind of Churchill ARK with rocket-launched ramps, which was a Specialised Armour Establishment project.

Although the Mark VII/VIII had the same type of suspended steering 'handlebars' as other Churchills, the extension that also gave steering control to the hull machine-gunner was no longer fitted, being regarded as pointless.

A Mark VIII seen in India with unofficial members of the crew.

However, there was a device on the machine-gunner's side that enabled him to kill the engine in an emergency. There was a small door in the bulkhead at the rear of the crew compartment, behind which was a panel of wire mesh held in a frame. This bulkhead separated the fighting compartment from the engine, and the little door was opened and held in the open position when the gun was being fired to provide extra ventilation. But it had to be closed when the engine was started, otherwise it interfered with the engine cooling system.

In the roof of the turret, on the right side, was a 2in smoke bomb launcher. This weapon, which was a standard fitting in most British tanks, fired a finned smoke bomb which was loaded by 'breaking' the weapon like a shotgun. However, since the weapon was fixed it could only be aimed by traversing the turret. The approximate range (20 yards, 70 yards or 110 yards) was selected by moving a gas regulator lever on the barrel, which operated a valve. Another fitting common to most of the later tanks was a device that caused a smokescreen to be laid behind the tank. A pair of smoke generators was carried low down at the rear and activated by push buttons in the driver's position. It was also possible to deposit the smoke generators in the road while the tank went on its way.

Another item that featured in the Mark VII/VIII Handbook, although it had appeared on Churchill tanks before then, was the mud plough. This was located at the back of the tank between the 11th road roller and the drive sprocket. The 11th roller, on each side, was interesting enough. It was angled in such a way that it was clear of the ground and guided the track onto the teeth of the drive sprocket, but also prevented the track from curving inwards when the back of the tank was descending a bump in the ground. As a result, this unit did not require the multiple springs used for suspension but instead only had one, the main spring, to keep it in place. The mud plough itself was an angled piece of steel, pivoting by a short arm from the skirting armour. Its job was to scrape excess mud off the inner surface of the track to prevent it from becoming clogged in the drive sprocket. However, when there was no risk of mud being picked up by the tracks, the mud plough could be held clear of the track by a handle and wire arrangement, incorporating a spring. It would have to be raised and/or lowered by hand, but it was a useful item.

Although some Heavy Churchills were adapted to fill auxiliary roles after the war, they will not be included here, so only one modification to a gun tank will be mentioned. This involved a Mark VII gun tank which was fitted, experimentally, with a system of panels of expanded metal on the sides of the turret and hull, spaced a few inches away from the normal side armour and intended to pre-detonate hollow charge rounds such as may be fired from a Panzerfaust or similar weapon. It was never adopted, although the Churchill Mark VII in the Tank Museum, said to be the last one manufactured, has expanded metal covering the engine deck, which may be intended as an antidote to Japanese hand-held anti-tank weapons.

The Mark VIII, which was classed as a close-support tank, carried the 95mm Howitzer Mark I (the same weapon as mounted in the Mark V) with the same co-axial arrangement. This gun was provided with a HEAT round that could theoretically penetrate any armour up to 110mm thick at any range, but it was difficult to score a hit from a howitzer and was rarely used. The Mark VIII was otherwise virtually the same as the Mark VII. There is no photographic evidence that it ever saw operational service during World War II, although one close-support tank, which may have been a Mark VIII, was sent to Burma before the Japanese capitulation, for evaluating in that region. Certainly at least one Churchill VIII was sent to India and photographed there, while 15 are listed as being sent to Australia, along with (it is said) 36 Mark VIIs. At least one Mark VIII survives at the Royal Australian Armoured Corps Museum at Puckapunyal, Victoria, equipped as a Crocodile flamethrower. A list of tanks in service with the British Army early in 1946 includes 173 Mark VIII Churchills and 896 Mark VII gun tanks, which were due to be replaced by Centurions as they became available.

The Crocodile flamethrower is effectively a 'Funny' and is only mentioned here because most, if not all, the new Heavy Churchills were equipped to be

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1: CHURCHILL MARK V DEMONSTRATION IN AUSTRALIA

The Australian Army never used the Churchill tank in combat, but in 1949 1st Australian Armoured Regiment, at Puckapunyal, Victoria, became the only Churchill tank regiment in the Australian Army. At the end of the war, Australia ordered a substantial number of Churchills, but this was cut back to 51 machines, all of which are said to be of the A22F model, including 15 Mark VIIIs, armed with the 95mm howitzer. This would have provided sufficient tanks to equip one armoured regiment, with one or two left over, but illustrations suggest that they were not all of the A22F variant. As our illustration shows, the shipment included at least one Mark V. This was essentially the same as a Mark IV but armed with a 95mm close-support howitzer like the Mark VIII. It is shown during muddy jungle trials at Madang in Papua New Guinea. No markings at all are visible on the tank, so it may have been a reserve vehicle, unless it had not yet entered regular service. It may even have had a British crew with the experience to drive the vehicle in such difficult conditions, but it was watched by a sceptical and doubtful Australian audience.

2: A43 INFANTRY TANK BLACK PRINCE

The idea of producing an infantry tank with the latest 17-pdr anti-tank gun was first mooted in 1943, but no infantry tank in existence was big enough to take the larger and more powerful weapon. It was therefore deemed necessary to build a new one with a larger turret and the project was given to Vauxhall Motors. As a result, the new tank looked like a heavier and larger Churchill. There were some differences: the wider tracks were somewhat lower at the front to improve the driver's view, the suspension was strengthened and extended, and the air intakes were removed from the sides and mounted on the engine deck. But despite an increase in weight to 50 tons (10 tons more than a Churchill VII), the new tank, to be named Black Prince, used the same 12-cylinder, 350hp Vauxhall/Bedford engine. So, despite the fact that photographs of the tank in motion give an impressive sense of speed, the Black Prince had a pathetic top speed of 11mph.

1

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A popular place to photograph tanks, near the vegetable garden. This Mark VIII, with both turret hatches open, poses for its picture.

converted into Crocodiles at short notice. This included a series of bolts on the rear of the hull that accepted the Crocodile trailer and its hinged 'Link'. Holes in the front machine-gun mounting were provided for the armoured hood and counterbalance that was used when the Wasp flamethrower was installed instead of the machine gun. The tank was also ready to have the pipe added beneath the hull to carry the flame fuel. This may have been done in support of the original idea which permitted every Churchill regiment to modify some of their tanks to flamethrowers for a specific operation. A total of three regiments were ultimately equipped with Crocodiles exclusively and administered by the 79th Armoured Division, to the extent that a half-troop of two tanks could be issued for a specific operation.

CHURCHILL MARKS IX, X AND XI

Although listed as such, the Churchill Marks IX and XI tanks are believed never to have existed. There was a scheme at the end of World War II to rework existing tanks, fit them with turrets from Heavy Churchills and the front visor plate and equip them with weapons as follows: Mark IX to be armed with 57mm 6-pdr guns, Mark X to mount the 75mm Mark V/Va gun and Mark XI to carry the 95mm Mark I howitzer.

Such a conversion would not be simple; it would involve virtually rebuilding the tank, and in particular strengthening the area around the turret ring in order to cope with the weight of the new turret. However, Marks IX and XI do not appear to have been built, although a review of tank holdings from just after the war lists 33 of the Mark X version and the Cavalry Tank Museum at Ahmednagar, India, appears to have one such tank on display.

There was also a project to produce LT, or Light Turret, versions of the same tanks. These are more difficult to explain because essentially they would be very similar to existing Mark IV, VI and V tanks respectively, and

The same tank photographed from ground level. Note in this and the previous picture that no machine guns are fitted, but one gets a good view of the 95mm howitzer.

beyond showing some evidence of being uparmoured on the sides would be very difficult to tell apart from those types mentioned above.

A43 BLACK PRINCE

In 1942 the General Staff at the War Office announced that, looking to the future, they required both a cruiser and an infantry tank to mount the new 17-pdr anti-tank gun. The cruiser tank was initiated fairly quickly and appeared as the A30 Challenger, not a good tank by any means, but adapted from the A27(M) Cromwell and just about satisfactory within its limitations. The infantry tank was another matter. The main infantry tank in service at the time was the A22 Churchill, but it was regarded as hardly suitable, due to unreliability, and its proposed replacement, the A33 Excelsior, was never accepted for service. However, the Churchill redeemed itself and Vauxhall Motors, the parent company for the Churchill, was requested to design a new infantry tank, large enough to accept the bigger gun, in 1943.

All this, of course, ignores the fact that another tank was being designed around the same gun. This is what would become the A41 Centurion, although this was regarded as a long-term project. Besides being viewed by some as the first example of an all-purpose Capital Tank, as suggested by Field Marshal Montgomery, others saw the Centurion as the latest manifestation of the cruiser tank. However, almost everyone appeared to favour the sloped front plate, intended to improve protection, and this was recommended for the new infantry tank.

Perhaps it was inevitable, if Vauxhall Motors were asked to design it, that the new tank should look essentially like an enlarged Churchill, but it wasn't necessary. The hull was wider, since it had to take an enlarged turret ring, and a little bit longer. The air intakes no longer fitted to the sides of the hull but were relocated on top, behind the turret, with the inlet louvres on

The Black Prince (A43) prototype No. 3 seen outside a hangar.

the inner faces. There was a slight difference at the front, where the idlers had been lowered, so the top run of the tracks now sloped down in this area, as did the section of the trackguards above them. This was done in response to comments from General Martel, among others, who said that the driver's view from the original Churchill was too restricted. Whether this new arrangement was sufficient to make any difference is difficult to say, but that was why it was done. Even the suspension was more or less the same, only stronger, with more substantial brackets to hold it in place and with one more wheel station on account of the greater length. The tank ran on wider (24in) tracks.

The hull itself followed the same format, and in terms of armour thickness was the same as the Churchill Mark VII (152mm at the front and 92.95mm at the sides). It even had the same rounded doors on each side. In front of the driver there was a round vision port and a mounting for the hull Besa machine gun. The turret is in many ways a more interesting proposition. The mantlet was the new exposed type developed by Stothert & Pitt of Bath, first seen on the A34 Comet, usually covered by a canvas shield. It housed a 17-pdr Mark VI gun (76.2mm calibre) with, on its left, a co-axial Besa 7.92mm machine gun. The designers then seem to have lost their initiative because the rest of the turret is little more than a welded box, albeit with a recessed top plate like the A22F. This prompted the Department of Tank Design to ask why the A43 Black Prince mounted a different turret to that provided for the A41 Centurion. Surely, they argued, since both mounted the same gun only one was likely to be the best, so which one was it? The answer they got was somewhat mystifying, but of course it depends upon which A41 turret they were talking about. The answer was that by incorporating sloped sides in the Centurion turret, this gave an impression of greater armour thickness that satisfied the crew. If the designers were referring to the original turret, as fitted to the prototypes and the first version of the Centurion,

this did have slightly sloped sides but was otherwise a welded box, a little more stylish than the type fitted to the A43, but not that much different. However, from the Centurion Mark II onwards an entirely new type of cast turret was fitted, with even better protection.

The Black Prince prototype No. 4 stops alongside the wreck of an old Churchill Mark I on the range.

We now come to what is probably the most unusual thing about the Black Prince: the engine. The new tank was fitted with a 350hp Bedford 'twin-six', the same engine that had originally been installed in the Churchill Mark I, which weighed about 38.5 tons. The Churchill Mark VII (40 tons) had the same engine, with a reduction in speed from 15.5mph to 12.7mph. The Black Prince now weighed 50 tons and still had the same engine, with the speed reduced to 11mph. Why the Bedford engine was kept when a much better engine – the 600hp Rolls-Royce Meteor V12 – was available is not certain. One official publication of the time even claims incorrectly that the Black Prince was fitted with the Meteor, but that is wrong. The Meteor had been recommended, and would have raised the top speed of the Black Prince to about 22mph, although the height of the engine deck meant that it would have to be installed at a slight angle. There was one innovation with the new tank: it incorporated a new five-speed gearbox in the transmission. The gears were much closer together – too close, some critics said – but others said this made driving much easier. A driver needed to manage a swift gear change, if, for instance, he fumbled a change. The tank's speed could drop from 3.5mph to zero in one second and it would be necessary to start from the bottom again.

Critics also pointed out that the tank was too heavy to be carried by any of the normal tank transporters, but apparently it was just wide enough for a standard Bailey Bridge; indeed, it was 0.5in narrower than a Churchill Mark VII with air inlets on the sides. During trials at Westward Ho! in North Devon, the tank was found to be too wide to pass down the ramp of a Landing Craft, Tank Mark III, but it could be accommodated in a Mark IV. The welded hull was found to be comfortably watertight, but the tank had an inflatable rubber ring to seal the base of the turret when it was wading and this was found to be a nuisance when the turret was traversed while the tank was on the move.

In all, six Black Prince prototypes were built, but the war was over by the time they were completed so production orders with Vauxhall Motors were cancelled. Today only one tank survives: prototype No. 4, which is at the Tank Museum. The remainder were scrapped or expended as hard targets.

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Note: locators in bold refer to plates, illustrations and captions. All tanks are British unless otherwise stated.

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